SDSU Extension

iGrow Wheat

BEST MANAGEMENT PRACTICES

Chapter 22:
Insect Pests of Wheat

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This chapter discusses the important insect pests of wheat grown in South Dakota—the life cycles, plant damage, and possible management strategies. Included are wheat stem sawfly, brown wheat mite, Hessian fly, armyworm, wheat curl mite, wireworms, plus aphids including greenbug, and the Russian wheat aphid.

The High Plains Integrated Pest Management Guide has updated biological information, photographs, and pest recommendations for many crops including small grains. wiki.bugwood.org/HPIPM

Wheat Stem Sawfly *(Cephus cinctus)*

Wheat stem sawfly has been a serious but regional pest of both spring and winter wheat grown in the Northern Plains and the Canadian Prairie Provinces for more than 100 years. Recently, this pest has spread into the Northwest and North Central areas of South Dakota.

Wheat stem sawfly was first reported as a pest of spring wheat in the Canadian Prairie Provinces, increasing in economic impact until a resistant variety cv. 'Rescue' was developed. Resistance was based on a solid, pith-filled stem that protected the plant from successful insect colonization, preventing sawfly infestation. Over the past twenty years, sawfly has increasingly been found infesting winter wheat. Subsequently, resistant winter wheat varieties were developed by Dr. Phil Bruchner at Montana State University.

Early USDA-ARS surveys detected sawfly in western South Dakota at ~10%; however, more recent surveys have found infestations up to 60% in Northwestern South Dakota. Grower surveys in Montana in the mid 1990s estimated the economic impact of wheat stem sawfly at $25 million per year. In North Dakota, a 2009 survey found crop loss due to wheat stem sawfly ranged from 10 to 25%; estimated crop losses between $25 to $70 million dollars. Wheat stem sawfly is a damaging pest of wheat affecting both yield and quality. Increased incidence of this pest in South Dakota is of concern.

Figure 22.1. Wheat Stem Sawfly. (Photo courtesy of Frank Peairs, Colorado State University, Bugwood.org. Illustration courtesy of Art Cushman, USDA. Property of the Smithsonian Institution, Dept. of Entomology, Bugwood.org)

Identification and lifecycle

Wheat stem sawfly eggs are laid singly within the stem (Fig. 22.1). They are football-shaped and less than 1/16" in length, but can be seen by eye when a stem is split. Multiple eggs may be laid within an elongating stem; however, cannibalism among larvae ensures that only one larva survives in a single stem. Pre-boot stage and larger diameter stems are preferred for egg deposition.

Newly-hatched larvae are pale and begin feeding on the stem pith passing through 4 or 5 instars before reaching maturity at approximately 3/4". Larvae can be detected when stems are split and a white-bodied larva with a dark head capsule emerges taking an 'S' shape when released from the stem. As the grain stem dries, larvae move to the base of the stem and cut a V-shaped notch that girdles the stem from within. There is an increasing tendency for the notched stem to snap cleanly off as it dries and becomes more brittle, resulting in lost grain heads. Consequently, the combine is unable to pick up the 'cut' stems during harvest. Larvae plug the stem below the notch forming a 1- to 2-inch 'stub,' spin a cocoon within the stub, and overwinter as larvae. The larvae overwinters in the cocoon, insulated by the soil, and pupates in the spring for approximately two weeks, before adults emerge in June.

Adult wheat stem sawflies emerge from the previous year wheat stubble by chewing through the plugged stub. Adults are dark and slender, approximately 1 inch in length, with yellow markings on the abdomen. Generally, mating occurs immediately upon emergence, though females do not need to mate in order to produce viable eggs that produce males; fertilized eggs become females. Adults are not thought to be strong fliers but can readily move to nearby fields to mate and lay eggs. Wind will also aid adult dispersal. When adults are present, they are not difficult to see. Detection is aided by using a standard sweep net.

Wheat stem sawfly adults are short-lived (7 to 10 days). Emergence may occur over a 4- to 6-week period depending on environmental conditions. Female sawflies deposit eggs into wheat stems from stem elongation to boot. The developing larvae pass the remainder of their life cycle within a wheat stem, providing limited management opportunities.

Plant damage

Wheat stem sawfly larval feeding causes a 17% yield reduction in cut stems and an 11% reduction in uncut stems (Holmes 1977). In addition to direct feeding by larvae, grain is also lost by lodging. Sawfly feeding can also reduce the protein content of the grain. A grower survey conducted in Montana estimated that $25 to $30 million dollars are lost each year to sawfly infestation (Blodgett et al. 1997). Additional economic consequences are damage to machinery as producers reduce the height of the cutting, slower harvest speeds, and the increased charges added by custom cutters when sawfly damage is evident.

Spring wheat, winter wheat, and durum wheat are the main cereal crops attacked by wheat stem sawfly, though infestations in other small grains such as barley, triticale, spelt, and others have been observed. Wheat stem sawfly does not complete their life cycle on oats. Wheat stem sawfly also survives on a number of grasses including species of *Agropyron*, *Bromus*, *Elymus*, and *Elytrigia*, in addition to cereal crops.

Management

Insecticides have not provided consistent control for wheat stem sawfly. Cultural controls such as burning, tillage, and trap cropping offer some control but are not compatible with production practices in all parts of the region. Conservation of biological control agents by raising cutting heights or using a stripper-header on the combine can be factors in helping to manage wheat stem sawfly on an area-wide basis. Planting resistant/tolerant cultivars offers the most consistent and satisfactory results. Currently, resistance/tolerance is based on solid stem varieties, stems that are filled with pith. Research continues to find additional sources of resistance and improvements to the cultural methods mentioned.

Cutworm Species

In South Dakota two major cutworm species that damage wheat are the pale western and the army cutworm. Outbreaks can occur when cutworm populations are high and weather conditions are favorable for survival. However, outbreaks do not necessarily occur in successive years.

Army Cutworm *(Euxoa auxiliaris)*

The army cutworm is a native of North America with damaging populations that change each year through migration within its distribution. The adult is a strong flier annually migrating each summer to high elevations (ca. 10,000 ft) in the Rocky Mountains.

Identification and life cycle

The army cutworm has one generation per year. The adult stage is a moth that varies in color from light to dark gray-brown. In late summer and fall, the moth returns to the Great Plains mating and laying eggs in the soil. Egg hatch is triggered by moisture in the fall and early winter; larvae are the overwintering stage of the insect. Dry periods during August through October are detrimental to egg hatch and survival of newly hatched army cutworm larvae.

Larvae feed during late fall and winter on perennial and fall seeded crops, such as alfalfa and winter wheat. The larvae feed at night, spending their days resting beneath the crop residues or in the soil. In Colorado, army cutworm damage to winter wheat or alfalfa generally occurs in the fall, whereas in South Dakota and Montana, damage typically occurs in the early spring. When larvae are abundant and food is in short supply, they will move en mass, 'army style' to adjacent fields, hence the name army cutworm.

After larval feeding is complete, a pupal chamber is constructed within the soil. Moths emerge in May and June and migrate hundreds of miles to higher elevations in the Rocky Mountains to escape high summertime temperatures. At this stage, army cutworm moths are also the 'millers' that become a household nuisance during their migration.

Monitoring
On clear sunny days, they can be found just below ground by scraping away the soil surface or by sieving soil through a mesh screen. Larvae of both species are well-camouflaged and difficult to detect in soil. Both methods are time and labor intensive and treatment decisions are often based on detection and characteristic plant damage, though thresholds are available in the *High Plains IPM Guide*. Bare spots in the field should be examined to differentiate winterkill from potential cutworm damage. Larvae may be detected more readily on the edge of a damaged or bare area.

Sidebar
The army cutworm has an interesting biology that affects management. Adult moths aggregate during the summer at high elevation sites, in shaded locations under stumps, logs and other structures that offer protection. Wildlife researchers report that these dense aggregations of cutworm moths are an important food source for grizzly bears. Grizzly bears have been observed returning to army cutworm aggregations sites and feeding during July and August when other food sources are limited.

Plant damage
Army cutworms have a very wide host range and will feed on most crops grown, but are especially damaging to perennial or fall-seeded crops, crop plants present when larvae are active. This species is a climbing cutworm, moving up the plant at night or on cloudy days to feed on leaf tissues. While some leaf feeding may be tolerated, extensive feeding may cause unrecoverable plant death. In South Dakota, the army cutworm is primarily a pest of winter wheat and alfalfa with damage occurring in early spring.

Pale Western Cutworm *(Agrotis orthogonia)*

The pale western cutworm has a range that includes the Great Plains through the western U.S. and southern Prairie Provinces (Fig. 22.2). The pale western cutworm does not migrate like the army cutworm and its populations may build up in an area if environmental conditions are favorable.

Figure 22.2. Pale western cutworm, top and Army cutworm, bottom. (Photo courtesy of University of Nebraska Department of Entomology)

Identification and life cycle
Adults fly during August through early October mating and laying eggs in the soil. The egg is the overwintering stage of this insect, hatching in the spring. Pale western cutworm larvae feed and remain below ground through the life stage and are difficult to monitor because of their subterranean habit. The pale western cutworm is grayish-white in color, unmarked by spots or stripes, with two distinct vertical brown bars on the front of the head capsule. A fully developed larva is about 1" in length.

Pale western cutworm larvae begin feeding later in the spring than the army cutworm and are therefore primarily a pest of spring wheat. Dry weather favors the successful development of the pale western cutworm. However, spring rains are unfavorable to newly-hatched pale western cutworm larvae. The risk of an outbreak decreases with increasing number of wet days, > 0.25 inch of precipitation (Hein et al. 2006). If May and June have fewer than 10 days with 1/4" or more of rainfall, then pale western cutworm populations can be expected to increase. If May and June have more than 15 'wet' days, then cutworms will almost totally disappear. Rainfall events of more than 1/4" tend to drive the cutworms to the soil surface, which exposes them to predation and parasitism.

Plant damage
Small grains, corn, and a variety of other crops have been damaged by pale western cutworm. The pale western cutworm is the more damaging of the cutworm species, because it chews through the stem, killing the plant and reducing plant stand.

Management
Because of the sporadic nature of army cutworm outbreaks, management options are limited to the use of insecticides. Treatments are warranted if more than 2 to 4 army cutworm larvae per ft2 are detected. The treatment threshold for pale western cutworm is lower, however, because they are the more damaging. The economic threshold for pale western cutworms is 1 to 2 larvae per ft2. For both cutworm species, pyrethroid insecticides have been very effective.

Brown Wheat Mite *(Petrobia latens)*
Brown wheat mite, a pest of wheat and barley, is of particular concern during dry weather periods primarily in western South Dakota. An image for the brown wheat mite can be found at http://www.ento.okstate.edu/ddd/insects/brownwheatmite.htm.

Identification and life cycle
Mites are tiny, spider-like creatures with four pair of legs and they are about as big as the period at the end of this sentence. Mites are oval with dark red-brown bodies and lighter yellow-orange legs; the front legs are about twice as long as the other three pairs of legs. Unlike mite species that produce webbing, the brown wheat mite is free-living without webbing. In spring and early summer, mites lay red eggs that hatch after a short period of time, producing multiple generations. However, as the season progresses, female mites begin to produce white eggs that remain dormant until fall. The white eggs are a resting stage indicating that mite activity is declining.

Plant damage
Brown wheat mites move from the soil to the host plant to feed on foliage. Feeding produces a fine white speckling called stippling, which is caused by the removal of chlorophyll from each feeding site. Stippling typically coalesces causing the leaves to turn light green to white colored and droughty in appearance; mite damage is often confused with symptoms of drought stress. Brown wheat mites are known to damage a wide variety of cultivated plants including alfalfa, wheat, clover, and other small grains.

Monitoring
Mites are difficult to monitor because of their small size and lack of webbing. However, their presence can be detected with the aid of a hand lens or by tapping foliage over a white paper and counting the just visible, dislodged mites, which appear as small brown spots that smear orange-brown. Volunteer wheat is an important reservoir for brown wheat mites (and other arthropods) and should be examined when weather conditions favor mite population development.

The economic threshold for this pest is not well defined but treatment is not profitable unless there are at least several hundred mites per row foot in the early spring. It is often difficult to justify a chemical treatment, since brown wheat mite infestations are associated with drought stress. Mite treatment may not be economical if yield and/or quality are compromised by drought stress.

Management
Moisture in the form of rainfall or irrigation will dramatically reduce mite populations; a driving rain of at least 1/3" will reduce populations. If white eggs are present, the population is entering a dormant state and treatment is not justified. Management of volunteer wheat is an important preventive measure for brown wheat mites and other small grain pests. However, once an outbreak occurs, chemical control is the only effective (albeit temporary) management option.

Hessian Fly *(Mayetiola destructor)* (Say)

Hessian fly has been increasing in many Midwest states and has been found in South Dakota, though damaging populations are not common (Fig. 22.3 and 22.4). It is thought that recent population increases are related to increased adoption of no till.

Figure 22.3. A Hessian fly on a leaf.
(Photo courtesy of University of Nebraska Department of Entomology)

Figure 22.4. Larval Hessian flies.
(Photo courtesy of University of Nebraska Department of Entomology)

Identification and life cycle

Adult flies resemble a dusky mosquito and are approximately 1/8" in length. Hessian fly overwinters within a 'flaxseed'-like structure found in wheat crop residue from which the fly emerges in the spring. Typically Hessian flies in the Great Plains have an early spring generation and a summer generation that overwinters on wheat stubble. Adults emerge and mate in the spring, laying their orange-red colored eggs on the upper surface of the leaf blade parallel to the leaf veins. Upon hatching, the larvae move to the leaf sheath where they are protected from dry environmental conditions. When feeding is completed, the larvae move lower on the plant forming the flaxseed. Highly infested plants may have up to 20 or more Hessian fly 'flaxseeds' on the crown of one plant.

Plant damage

Hessian fly maggots feed by rasping plant stems and sucking plant juices that ooze from the damaged stem surface of wheat and barley. While feeding, they introduce a plant toxin that causes plant tissues near the feeding site to be stunted and misshapen. Leaves may appear thickened, erect, and bluish green in color. The stem that the maggot feeds on often has a reduced or no grain head, and the stem may be deformed and/or weakened at the point of feeding. As the plant matures and tissues dry, the weakened Hessian fly feeding site is prone to breakage.

Hessian fly damage is detected through careful plant inspection before stem breakage at or before harvest. A new pheromone has been developed that may be used for detection (M. Harris, North Dakota State University). Infestations of less than 10% stems, with one flaxseed per stem, are estimated to reduce yields less than one bushel per acre (Whitworth et al. 2009).

Management

Resistant varieties are not currently available for this pest. Although there are known parasitic wasps of Hessian fly, there are no management practices for conserving parasite populations.

Undisturbed stubble favors Hessian fly survival. Studies have shown that when infested plant material containing the flaxseed stage are buried 1 inch deep (by tillage), there was 26% fly emergence; at 2 inches, only 6% of the population emerged; and at 4 inches, none emerged (Whitworth et al. 2009).

Volunteer wheat stubble favor Hessian fly populations by providing additional host plant material. Additionally, destroying volunteer wheat provides protection from wheat curl mite, brown wheat mite, and aphid species. In South Dakota where both spring and winter wheat crops are planted, and Hessian fly pressure is sporadic, agronomic considerations outweigh Hessian fly management. Crop rotations that avoid continuous wheat may help to break the cycle.

Seed treatments may control Hessian fly for up to 30 days, but are only recommended in states when consistent populations are present and economic damage is expected. Seed treatments are not recommended in South Dakota because the Hessian fly populations are sporadic.

Armyworm (Pseudaletia unipincta)

Identification and life cycle

Armyworm is a sporadic South Dakota wheat pest (Fig. 22.5). Mature armyworms can reach 11/3" length, have smooth-bodies, and range in color from green to brown with longitudinal stripes down the back. Black markings on the head capsule are characteristic of this pest.

The armyworm is unable to survive South Dakota winters. They overwinter in the southern portion of their range, migrating north in early summer when environmental conditions are favorable. Pheromone traps can be used to monitor the moth's presence. Female moths deposit eggs in rows or clusters on the lower leaves of various grass crops. Dense grassy vegetation is preferred for oviposition.

Figure 22.5. Armyworm larva.
(Photo courtesy of David Keith, University of Nebraska Department of Entomology)

Plant damage

Armyworm feeding is mostly limited to grasses, although this insect will feed on a number of other host plants when starved. Larvae feed at night and on cloudy days, feeding on plant foliage, defoliating plants. During the day, larvae remain protected under crop debris. One or more generations may occur per year. In Colorado, armyworm is mostly a pest of corn and spring grains, with only occasional infestations occurring in winter wheat. In Wyoming, grass hayfields are periodically damaged.

Monitoring

Armyworm moths should be scouted on the field margins, low areas with excessive (rank) growth, or areas of lodged plants (Chapter 21). Look for feeding damage (defoliation), frass (droppings) around the base of the plant, head clipping, or plant tillers that have been clipped by armyworm feeding. Check for larvae in and under debris around damaged plants and in heads of wheat or barley. Migration to an area may be detected by using pheromone traps to monitor adult activity.

Management
Armyworm outbreaks are sporadic due to the migration of armyworm adults into the state. Because of the sporadic and unpredictable nature of armyworm outbreaks, management options are limited to the use of insecticides.

Wheat Curl Mite *(Aceria tosichella)*

Identification and life cycle
The wheat curl mite is approximately 1/100" in length and can be viewed with a hand lens. The mite completes its life cycle in 8 to 10 days passing through two nymphal stages before reaching the adult stage. Adults do not fly but because of their light weight, are carried on air currents and wind. Mites have multiple and overlapping generations and all stages are able to overwinter on green plant material and crop residues with the capacity to build up large populations when temperature and moisture are favorable.

Mites are more frequently found at the base of a wheat leaf on the upper leaf surface in the depressions between leaf veins, under the leaf sheath, or within the head. Wheat curl mite has several cultivated and non-cultivated grass hosts. An image of wheat curl mite is available at http://www.ento.okstate.edu/ddd/insects/wheatcurlmite.htm.

Plant damage
Wheat curl mite is a vector of wheat streak mosaic virus and other closely related viruses. Mites pierce plant tissues and suck juices, causing leaves to roll and the virus to be introduced. Symptoms of the wheat streak mosaic are discussed in Chapter 23.

Several sweet corn varieties and a few field corn hybrids are susceptible to wheat streak mosaic virus disease. Susceptible sweet corn varieties and hybrids can harbor mites and the virus can move into and infect winter wheat.

Monitoring
Wheat curl mites are difficult to detect because of their small size. Volunteer wheat should be inspected for mites because it provides a 'green bridge' for mite populations. The green bridge enables mites to move between crops and can infest early seeded winter wheat crops.

Management
Cultural controls that break the green bridge are the most effective and economical methods of managing the wheat curl mite and wheat streak mosaic. When conditions favor the wheat curl mite, the mite or symptoms of wheat streak mosaic are present. Actions such as volunteer wheat control and delayed planting of fall winter wheat can reduce the impact on the subsequent wheat crop. A good mitigation strategy is to avoid planting alternative and/or susceptible hosts such as sweet corn, foxtail millet and other grass crops that can act as green bridge crops. Mites require green plant tissue to survive and, therefore, breaking the green bridge can reduce its impact. Chemical control of the mite has not been shown to be consistently effective.

Wireworms *(Coleoptera: Family Elateridae)*

Wireworms may require several years to complete their life cycle and are the larval stage of the click beetles.

Figure 22.6. Wireworms, larvae of elaterids.
(Photo courtesy of University of Nebraska Department of Entomology)

Identification and life cycle

Adult click beetles are brown to black in color, elongate and their thorax is structured such that an audible click is heard when adults arch their back to right themselves. Females deposit eggs in the soil among grass roots in the spring. Initially, small larvae are white, but later mature stage larvae develop harder (sclerotized) plates that are yellow to red brown in color (Figure 22.6). Mature larvae range from 1/2" to 1" in length.

Larvae feed on the roots of corn and other grasses, including wheat. They are very sensitive to soil moisture and temperature, moving up into the root zone in the spring in response to warming soils and adequate moisture. As soil moisture levels decrease and soil temperatures warm, larvae move deeper into the soil. Life cycles of wireworm species range from one to five years, moving within the soil profile to feed and pupating once the larval stage is complete. The insects overwinter in the soil.

Plant damage

Wireworm larvae are associated with grassy vegetation. Cropland that is established on former grasslands or continuously cropped to crops in the grass family is at risk for wireworm damage. Feeding occurs in the early spring when wireworms move into the root zone in response to favorable soil temperature and moisture conditions. Larvae feed on seed, roots, and underground stem tissue. Seedling plants may be killed and plant stands reduced. Poor seedling emergence, root feeding, and uneven stands can be symptoms of wireworm damage. Winter damage may be confused with wireworm damage.

Monitoring

Wireworms can be monitored pre-plant by collecting soil samples or by establishing solar bait stations. Stations are baited with approximately 1/2 cup (4 oz) of soaked grain (to speed germination) that attract larvae. The bait is placed in the soil and covered with mounded soil. The mound is covered with clear plastic to warm the soil around the bait station and attract wireworms. Bait stations are excavated in 7 to 10 days to assess wireworm populations (Wright et al. 2006).

Management

Insecticide seed treatments are the most effective strategy for controlling wireworms. Foliar treatments are not effective in managing larvae that feed and reside below ground.

Aphid Species *(Aphididae App.)*

Several species of aphids can have important impacts on wheat production in South Dakota. The more damaging species are virus vectors and/or inject plant toxins that cause damage that is disproportionate to their numbers. Typically, aphid populations in South Dakota occur as an aphid complex.

Bird Cherry Oat Aphid *(Rhopalosiphum padi)*

This species is one of the most common and damaging species in South Dakota and the vector of the barley yellow dwarf virus. Additional information about this disease is available in Chapter 23.

Figure 22.7. Bird Cherry Oat Aphid. (Photos courtesy of David Cappaert, Michigan State University and Frank Peairs, Colorado State University, Bugwood.org)

Identification and life cycle

The bird cherry oat aphid ranges in size from 1/32" to 1/16", and is dark green to olive green in color. The key feature distinguishing this species is the red-orange patch at the base of the cornicles (tailpipes). Aphids have multiple and overlapping generations throughout the growing season, enabling populations to increase rapidly when temperatures are favorable. The bird cherry oat aphid overwinters in the egg stage on Prunus species hatching and migrates to cereal crops in late spring to early summer. Populations are often abundant in fall on winter wheat crops.

Plant damage

Aphids have piercing-sucking mouthparts and damage plants by removing plant nutrients; however, significant damage by this species is caused by the virus it vectors, barley yellow dwarf virus (BYDV). BYDV causes stunted plants, small heads, and shriveled kernels resulting in reduced yields. Production of the honeydew that aphids excrete can interfere with grain harvest.

Monitoring

Aphids can be monitored by plant inspection assessing the number of aphids per stem and the percentage of infested plants. These assessments are based on the economic thresholds for aphid species. Although aphids can be rapidly detected using a sweep net, treatment decisions are based on the more rigorous aphid/plant assessments.

Greenbug *(Schizaphis graminum)*

Greenbug is a true aphid and damages both by direct feeding and by injecting a toxin into the plant that causes additional plant damage.

Identification and life cycle

The greenbug is a small aphid and ranges in size from 1/16" to 1/8". It is light green in color and has a dark green stripe down its back. The legs and cornicles are also light in color. Aphids have multiple and overlapping generations throughout the growing season, enabling populations to increase rapidly when temperatures are favorable. This species is also a pest of sorghum, and small grains in proximity may experience migration between these preferred crops. The greenbug overwinters in the egg stage, hatching and migrating into cereal crops during spring and early summer.

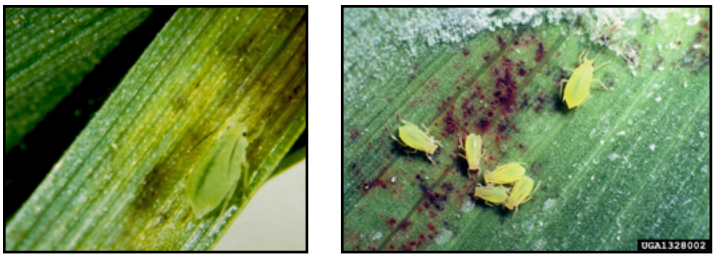

Figure 22.8. Greenbug. (Photos courtesy of Alton N. Sparks Jr., University of Georgia and Frank Peairs, Colorado State University, Bugwood.org)

Plant damage

Aphids have piercing-sucking mouthparts and damage plants by removing plant nutrients and injecting a plant toxin causing leaves to turn yellow. Symptoms may be confused with nitrogen deficiency moisture stress, but the presence of this species allows these factors to be differentiated. Greenbug also vectors barley yellow dwarf virus.

Monitoring

Aphids can be monitored by plant inspection assessing the number of aphids per stem and the percentage of infested plants. These assessments are based on the economic thresholds for aphid species. Although aphids can be rapidly detected using a sweep net, treatment decisions are based on the more rigorous aphid/plant assessments.

Russian Wheat Aphid *(Diuraphis noxia)*

This species is one of the most damaging species in western South Dakota because a plant toxin is injected into the plant during feeding.

Identification and life cycle

The Russian wheat aphid measures 1/16" to 1/12", is a dusty blue-green in color, has shortened antennae, greatly reduced cornicles, and the appearance of a double caudal or tail when viewed from the side. The Russian wheat aphid is not able to survive the cold winter temperatures in South Dakota. Infestations of this species rely on migration from southern cereal production areas. Once present in the state, it has multiple and overlapping generations throughout the growing season. Russian wheat aphid, like other aphid species, can increase rapidly when conditions are favorable.

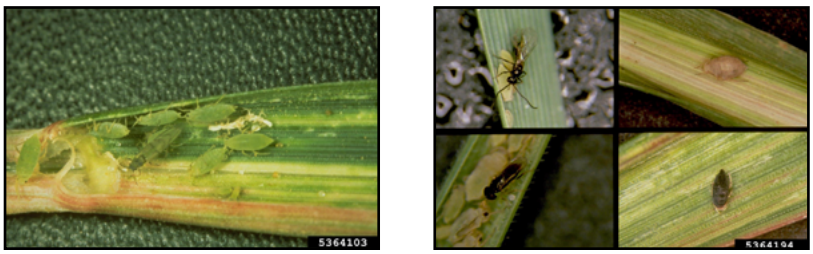

Figure 22.9. Russian Wheat Aphid. (Photos courtesy of Frank Peairs, Colorado State University, Bugwood.org)

Plant damage

Russian wheat aphid have piercing-sucking mouthparts that damage plants by removing plant nutrients. They inject a plant toxin causing leaf rolling accompanied by white streaks in leaves that may have some areas of purple discoloration. Rolled leaves trap the subsequent leaf or grain head creating a distinctive hooking of emerging plant tissue. These symptoms are characteristic of Russian wheat aphid infestation and can result in reduced grain yield when populations are sufficiently large.

Monitoring
Aphids can be monitored by plant inspection assessing the number of aphids per stem and the percentage of infested plants. These assessments are based on the economic thresholds for aphid species. Although aphids can be rapidly detected using a sweep net, treatment decisions are based on the more rigorous aphid/plant assessments.

Management
Several natural enemies, both predators and parasitoids help to manage aphid populations. Species of lady beetles, lacewings, Syrphid fly, damsel (nabid) bugs, orius (minute pirate bug), lacewings, and assassin bugs are the major species of predators. There are several parasitic wasps that attack aphids causing the affected aphid to enlarge and harden to a mummy.

Controlling volunteer wheat, which can harbor aphid populations and provide a bridge between susceptible crops, is important to inspect regularly and manage as needed. Early planting of spring wheat and delayed planting of winter wheat can help avoid periods of increased risk of aphid infestation.

There are several insecticides that are effective in controlling aphid populations when treatment is warranted when the threshold is reached. The High Plains Integrated Pest Management Guide has biological information and updated pest recommendations for many crops including small grains/wheat. wiki.bugwood.org/HPIPM

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